

SENN (N.)

INTESTINAL TUBERCULOSIS

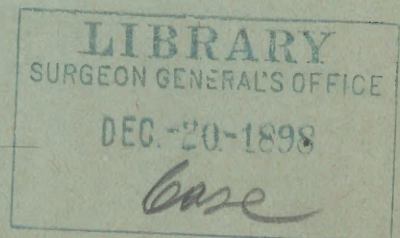
1, Etiology, Pathology and Diagnosis.

2, Surgical Treatment.

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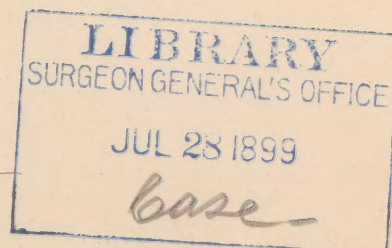
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Etiology, Pathology and Diagnosis.

Address in Surgery delivered at the Meeting of the Ohio State Medical Society, May 5, 1898.

Renewed interest has been awakened in the subject of intestinal tuberculosis since recent experience in modern aggressive surgery has taught the profession that some of the cases in which the disease occurs as a primary affection are amenable to successful surgical intervention. Intestinal tuberculosis appears under so many different pathologic forms and presents such various clinical aspects, that it becomes necessary to inquire carefully into its etiology and pathology, in order to enable the surgeon to exercise the necessary care in the selection of cases for operative treatment. The field of abdominal surgery is rapidly increasing in extent and usefulness, and one of its most recent acquisitions is the successful treatment of certain forms of intestinal tuberculosis.

It is my intention on this occasion to discuss as briefly as possible the etiology, pathology, symptoms and diagnosis of this affection of the intestinal canal, with special reference to the indications which dictate and warrant surgical interference.

Frequency of intestinal tuberculosis.—Intestinal tuberculosis is a very common complication of pulmonary and miliary tuberculosis. It is not often met with as a primary affection. In one thousand tubercular subjects examined postmortem in the Pathological Institute at Munich between the years 1886 and 1890, only one case of primary intestinal tuberculosis was noted, while in 566 cases secondary intestinal tuberculosis was seen.

That the disease occasionally occurs as a primary affection can no longer be doubted; the results of an enormous clinical experience and thousands of necropsies furnish a substantial verification of this fact. There can, however, be but little doubt that in many cases of tuberculosis of the intestine in which the clinical features point only to this organ as the sole seat of disease, careful search would reveal old, perhaps latent tubercular foci in some other part of the body. The prudent surgeon selects for his operative work only the cases in which he has reason to believe, from the clinical history and the signs and symptoms presented, that the disease is limited and confined largely if not entirely to the intestinal canal.

Tuberculosis of the stomach.—As primary intestinal tuberculosis is for the most part a feeding disease, it is interesting to know whether or not the stomach is ever the seat of tubercular infection. For good reasons we have for a long time assigned to the gastric juice a destructive, or at least an inhibitory effect on pathogenic bacteria, but the results of experimentation and clinical observations seem to combine in proving that the virulence of the bacillus of tuberculosis is little if any impaired on its way through the stomach. It

is natural to assume that in cases in which the physiologic activity of the glandular appendages of the stomach is lessened, the antiseptic properties of the gastric secretions would be correspondingly diminished. The correctness of this statement is borne out by the experience of many reliable clinicians and by the results of experimentation on the lower animals. Blumer (*Albany Medical Annals*, March, 1898) reports a case of tuberculosis of the stomach in which he found postmortem an old caseous area at the apex of the right lung which had softened at the lower part, general miliary tuberculosis, tuberculous ulcers of the stomach and ileum, tuberculosis of the kidneys and of the aorta. The stomach lesion consisted of three or four small, shallow, circular ulcerations, and near them, numerous miliary tubercles. Blumer has studied the literature of the subject and finds but thirty cases on record, in all of which the gastric lesion was secondary to tuberculosis elsewhere. He divides the reported cases into miliary tuberculosis, and single and multiple ulcerations. Four were cases of pure miliary tuberculosis of the stomach wall; about eight were single and the remainder multiple ulcers.

Tuberculosis of the stomach usually occurs only in connection with similar affections of other organs, especially the intestinal and lymphatic glands. The ulcers are pale and have thickened edematous edges. The inflammatory product presents the usual evidences of the nature of the disease—giant cells, bacilli and perhaps cheesy material. The disease in this locality presents no characteristic symptoms. Perforation and hemorrhage may occur under the same circumstances as in intestinal tuberculosis. The ulcer presents a sharp contrast to its dark-colored surroundings. In a few cases the serous coat over the floor of the ulcer is studded with miliary tubercles. In Litten's case the tuberculosis of the digestive tract was limited to the stomach. Similar cases have been described by Talamon-Balzer, Gilles and Eppinger. Musser ("Tubercular Ulcer of the Stomach," Philadelphia Hospital Reports, Vol. i, p. 117) found a tubercular ulcer of the stomach one and one-half by three and one-half inches on postmortem examination of a patient who had died of pulmonary tuberculosis. Tubercle bacilli were found in the cheesy material. Most of the cases of tubercular ulcer of the stomach have been observed in children. The disease presents no characteristic symptoms. Musser claims that death in these cases often results from hemorrhage.

Tuberculosis of the stomach is a very rare affection, as is shown by the researches of Letorey (Thèse de Paris, 1895), who was able to find an account of only

twenty-one cases. This rarity is explained, to a certain extent, by the well known action of the gastric juice on the bacillus tuberculosis, which either dies or loses its virulence in an acid medium. Absence or diminution of hydrochloric acid would therefore favor the development of tubercular lesions, as would also other affections which impaired the digestive functions of the stomach. Letorey believes that the bacillus reaches the stomach more frequently by the way of the circulation than by entrance with infected food. The disease is more frequently demonstrated in the autopsy room than at the bedside. The usual site of the ulceration is near the pylorus and on the larger curvature. In only six cases out of the twenty-one was more than one tubercular ulcer noted, so that the lesion may be said to be generally single, the ulcer round or oval, with ragged and bleeding edges and a grayish-yellow floor. The ulcer occasionally reaches a diameter of from three to five centimeters. The prognosis in these cases is grave, since the patient usually dies from the effects of the primary pulmonary affection or tuberculosis of other organs, the gastric complication perhaps hastening the fatal termination. The occasional occurrence of tubercular gastritis is the best possible proof that the bacillus of tuberculosis may pass through the stomach, subjected to the action of the gastric juice, and still retain sufficient virulence on its entrance into the intestinal canal to exercise its specific pathogenic action upon the tissues prepared for its reception and multiplication by hereditary or acquired predisposing causes.

Etiology.—Primary tuberculosis of the intestinal canal is the result of infection from without by the ingestion of food contaminated with the essential cause of the disease, the bacillus of tuberculosis, usually in the form of tubercular milk and meat. The secondary form is caused by auto-infection by the entrance of tubercular sputa into the intestinal canal. The lymph follicles and Peyer's patches furnish the most favorable anatomic conditions for the localization and growth of the tubercle bacillus. Klebs believes that the introduction into the intestinal canal by the swallowing of sputa in phthisical patients is a frequent cause of intestinal tuberculosis. He discovered two tubercular ulcers in the stomach of a patient who had died of pulmonary tuberculosis. The supposition that intestinal tuberculosis is often caused by the ingestion of tubercular food or sputa is supported by the experiments of Malin, Parrot and Bonley, who found that animals fed with the expectorations of consumptives died of tuberculosis; while Chauveau, Bollinger and others succeeded in producing intestinal tuberculosis by feeding animals susceptible to the disease with fragments of tubercular lungs or with raw tubercular meat. The experiments of Gerlach, Zürn and Klebs demonstrated the dangers attending the use of milk from tubercular cows. In these experiments it was noted that the disease commenced in the form of an intestinal catarrh, and that the extension of the tubercular infection began through the mesenteric glands before the development of diffuse miliary tuberculosis. W. Zinn ("Ein Fall von Fütterungstuberculose bei einem erwachsenen Menschen, mit Ausgang in Miliartuberculose," *Münch. Med. Wochenschrift*, 1895, No. 37) observed a man 29 years of age who in the course of nine weeks died of acute miliary tuberculosis. The autopsy showed that the miliary tuberculosis had its origin in a mass of caseous tubercular mesenteric glands. No other old tubercular deposit could be

found. In the intestine, at a point corresponding to the diseased glands, was found the scar which followed the healing of a tubercular ulcer. The ulcer was evidently the primary lesion which led to tubercular lymphadenitis, and finally death followed from reinfection of the body from the tubercular glands, long after the intestinal ulcer had healed. General infection in this case took place through the thoracic duct. Wyss ("Zur Kasuistik der primären Darmtuberculose im Kindesalter," *Correspondenzblatt f. Schweiz-ärzte*, 1893, No. 22) found in seventy-one postmortems on children three instances of undoubted primary intestinal tuberculosis. In one case, a girl $5\frac{3}{4}$ years old who had died of diphtheria, a solitary tubercular ulcer was found in the ileum with extensive tuberculosis of the mesenteric glands. No trace of tuberculosis could be detected in any other organ. Upon inquiry it was ascertained that the child had been fed on milk almost exclusively for some time before she contracted diphtheria. In the other two cases the disease could be traced to the same cause.

Intestinal tuberculosis is found most frequently in children and young adults, although no age is entirely exempt. In the language of Virchow: "the predisposition to tuberculosis, the hereditary vulnerability resides in the tissues, and that the younger and more incompletely developed these are, the more readily will the vulnerability manifest itself in the presence of exciting causes." This may explain the special frequency of intestinal tuberculosis in children and in subjects affected by antecedent inflammatory affections of the intestinal mucous membrane.

Baumers ("Recherches sur la maladie propre aux enfants") first called attention to intestinal tuberculosis in children, which has been known as *tabes S.*, *phthisis mesaraica*, *febris mesaraica*, *febris xanthus infantum* and *intestinal scrofula*. Intestinal tuberculosis in children results in early and extensive infection of the mesenteric glands, from which reinfection usually terminates life by miliary tuberculosis. Secondary tuberculosis appears to be more frequent in adults than in children. In children intestinal tuberculosis is not within 30 to 40 per cent., in the adult in 60 to 70 per cent. The local predisposing lesion, although important in determining localization, is not essential, as the tubercle bacilli can penetrate the intact mucous membrane.

In six of Czerny's cases subjected to operative interference the patients were between 25 and 50 years of age, the average age being 39. In four of the cases tuberculosis was hereditary, in two cases the disease followed typhoid fever, and in one it was preceded by an acute attack of parametritis. In three of the cases the intestinal disease was complicated by pulmonary tuberculosis, and in one by diffuse miliary tuberculosis. In one case the infection occurred by the rupture of a tubercular adnexal abscess into the intestine, and in another the intestinal tuberculosis was complicated by actinomycosis.

Clinical experience has shown that intestinal tuberculosis pursues a more benign and chronic course in the adult than in children, and consequently the primary form of intestinal tuberculosis amenable to successful surgical treatment is met with most frequently in young adults and persons of advanced age, seldom in the case of infants and young children.

Infection from the blood is undoubtedly of quite common occurrence in primary and secondary intestinal tuberculosis. The most favorable cases for suc-

cessful surgical intervention are those in which a localized predisposing lesion furnishes an infection atrium for the entrance of tubercle bacilli into the tissues. These are the cases in which characteristic solitary or multiple tubercular ulcers develop which manifest an intrinsic tendency to heal, and in which an operation finally becomes a necessity after symptoms of obstruction indicate the existence of a cicatricial stenosis.

Pathology.—Intestinal tuberculosis presents itself clinically and pathologically in the form of a chronic catarrhal or ulcerative enteritis. The inflammation which follows the tubercular infection is characterized by a series of pathologic processes common to all tubercular affections, influenced and modified, however, by the structure and function of the tissues involved. The primary seats of infection are the glandular appendages of the mucous membrane, the lymph follicles and Peyer's agminated glands. The mode of infection resembles typhoid fever in many respects. The lower portion of the ileum and the ileo-cecal region are the most frequently infected, although any portion of the intestinal canal may be involved primarily or by extension. Of six cases of intestinal tuberculosis reported by Schiller ("Ueber die Darm Operationen an der Heidelberger Chirurgischen Klinik aus den letzten vier Jahren." Dissertation, 1896), which were operated upon by Czerny during a period of four years, the disease involved the ileo-cecal region four times, and the descending colon twice. In all cases of cecal tuberculosis operated upon by Czerny, the ulceration was limited on one side by the ileo-cecal valve; the mucous membrane of the cecum was extensively ulcerated, presenting elevations and depressions and polypoid excrescences between the ulcers; the cecal wall was much thickened and indurated. The lumen of the cecum was usually found contracted, the stenosis being the direct cause of the intestinal obstruction. In one case the mechanical impediment was found to be a sharp flexion at the insertion of the ileum into the cecum. In one case the contracted lumen of the cecum was divided by a band of cicatricial tissue. The bowel below the obstruction was, as is always the case, nearly empty, reduced in size and anemic, while on the proximal side reverse conditions existed, which facilitated circular suturing after excision. In acute cases, such as are observed in children, and which seldom come to the notice of the surgeon, the disease is usually diffuse and often implicates a large section of the intestinal canal above the ileo-cecal valve. Tuberculosis is apt to attack a portion of the intestinal canal subjected to mechanical irritation, as is the case in hernia.

A number of cases of tuberculosis of hernia have been reported. Bruns ("Beiträge zur Klin. Chirurgie," B. ix, p. 206) adds one new case to those previously published. In these thirteen cases the hernial sac was attacked ten times, and in seven it was alone the seat of disease. This, together with other conclusions, substantiate the belief, that "tuberculosis of hernia" may occur as a primary disease; generally, however, it is associated with peritoneal tuberculosis.

It appears from the present literature on the subject that tuberculosis in the ileo-cecal region and the colon is usually a disease of adults, although there are a few cases on record in which the intestinal canal at and below the ileo-cecal region was affected in children not more than 10 years of age.

Reclus (*Le Bulletin Médicale*, June 25, 1893) has

called attention to the rapidly increasing number of cecal tuberculosis cases which have been operated upon. The cases of Bouilly, Terrier, Hartmann, Reynier, Broca, Roux, Salzer, Billroth and Hochenegg, the anatomical researches of Duguet, Spillmann, Hérard, Cornil and Hanot, and the more recent descriptions of Pilliet and of Le Bayou have thrown some light upon this hitherto but little recognized affection. This affection may manifest itself as a localized tuberculosis without infiltration and as a purely local disease. This suffices to place this intestinal lesion among the surgical tubercloses. From the moment it is a limited focus and this focus is accessible, in such favorable circumstances intervention is legitimate. The greatest number of cases of cecal tuberculosis so far reported have been over 25 years of age.

It seems that two distinct anatomic-pathologic forms may be described, associated with different symptoms; the one a fibrous and the other an ulcerating variety; moreover, these may be combined, or there may be noticed many intermediate stages between the varieties. The majority of cases thus far reported have been characterized by an abundant tissue proliferation, which imparted to the swelling much of the aspects of carcinoma. The inflammatory mass is almost always found freely imbedded in plastic adhesions, and it is difficult if not impossible to outline the anatomic landmarks of the parts involved. Ordinarily the lesions are most marked around the ileo-cecal valve. The appendix is generally affected and constitutes a portion of the inflammatory mass.

The second or ulcerated form may present thickening of the peritoneum and adhesions around the intestinal loops, but these have not the remarkable hypertrophy of the other form; on the contrary the ulcerative process predominates, the mucosa has often completely disappeared, especially at the site of the ileo-cecal valve. Ulceration often leads to abscess and fistula formations. The fistulous openings are often multiple.

Cornil believes that in such cases the primary infection takes place in the appendix vermiformis, more especially when it is the seat of a fecal concretion or foreign body.

The tubercular infection may take place in the upper portion of the intestinal canal. Claude ("Ulcerations tuberculeuses du duodénum," *Bulletin de la Société anatomique de Paris*, No. 8, 1896) made a postmortem on a man 33 years of age who had died of pulmonary tuberculosis. He found tubercular ulcers in the upper portion of the duodenum; four other ulcers were found in the ileum. He attributed the intestinal disease to infection from the blood. During life this patient never showed any symptoms referable to the intestinal canal. The tubercular nature of the intestinal affection was established by histologic and bacteriologic examinations.

The entire length of the intestinal canal is seldom affected by tuberculosis, and in the exceptional instances when this is the case the disease pursues a rapidly fatal course. It has already been stated that intestinal tuberculosis always begins in the lymph follicles or Peyer's patches. The tubercular process is at first submucous, and reaches the surface only after degeneration and ulceration have taken place. The glands become swollen, can be felt under the epithelial lining as small hard nodules, which present a grayish color before caseation sets in. With the onset of caseation the swelling increases in size and

assumes a yellowish color. As soon as the overlying epithelial lining is destroyed softening of the inflammatory product and ulceration set in. The primary ulcer is small and round with yellowish margins. At the time the crater-like defect takes place the mass is not larger than a hemp-seed. Such small ulcers may heal, but more frequently progressive extension takes place in the direction of the blood vessels. In Peyer's patches the appearance of sieve-like defects can be seen during the early stages of the disease, which Rokitansky described as primitive tubercular ulcerations. They constitute the preparing stage or secondary tubercular ulcers. Even in superficial ulcers tubercles can constantly be found between the muscular fibers. By confluence and progressive infection the surface defects increase in size. Not infrequently remnants of intact mucous membrane remain between the different points of ulceration. The shape of the ulcer is variously modified by the confluence of several ulcers. The most extensive ulcers are found in the cecum, colon and terminal portion of the ileum.

The intrinsic tendency of intestinal tubercular ulcers is to increase in size in the direction of the blood vessels; that is, transversely to the long axis of the bowel, a pathologic feature which was first pointed out by Rokitansky (*Lehrbuch der path. Gewebelehre*, 1871, p. 327). The tubercular infection follows the lymph sheath of the blood vessels. Through the lymphatics the infection extends to the serosa, upon the surface of which miliary tubercles are often found over an area corresponding in extent to the base of the ulcer. The mesenteric glands are infected through the same channels. In children the mesenteric glands are often affected without an antecedent intestinal lesion. In such cases the tubercle bacilli penetrate through the mucous membrane and enter the lymphatic system without producing a demonstrable surface lesion, or infection takes place by the way of the general circulation. Infection through the mucous membrane undoubtedly is often determined by catarrhal enteritis, which damages the epithelial lining and prepares the way for invasion from the intestinal canal.

Extension of the ulcer in the muscular coat takes place by progressive extension of the ulcerating process and by diffusion of the infection through the lymph channels (Figs. 1 and 2). As soon as the serous coat is reached secondary plastic peritonitis is almost the constant result. Usually the peritonitis is limited to the affected portion of the bowel, between which and the adjacent viscera firm adhesions are formed. In exceptional cases the peritonitis becomes profuse without perforation. More frequently, however, the diffuse tubercular peritonitis is caused by the rupture of a peri-intestinal tubercular abscess. Perforation of a tubercular ulcer is often prevented by early and firm adhesions. In one of the cases reported by Rindfleisch the intestine was found perforated at five different points without causing diffuse peritonitis, owing to the existence of firm adhesions. Perforative peritonitis is so rare in intestinal tuberculosis that Leube saw only two cases during his service in the clinic at Erlangen. Leudet reports six cases that occurred in his practice, which were due to tubercular affection of the appendix. Eisenhardt (*"Ueber die Häufigkeit und Vorkommen der Darmtuberculose,"* Dissertation, Munich, 1891) found perforation in 28 out of 566 cases of intestinal

tuberculosis examined postmortem. Extension of the disease to other parts and organs frequently takes place through the lymphatic system.

Tubercular lymphadenitis is a frequent and, in

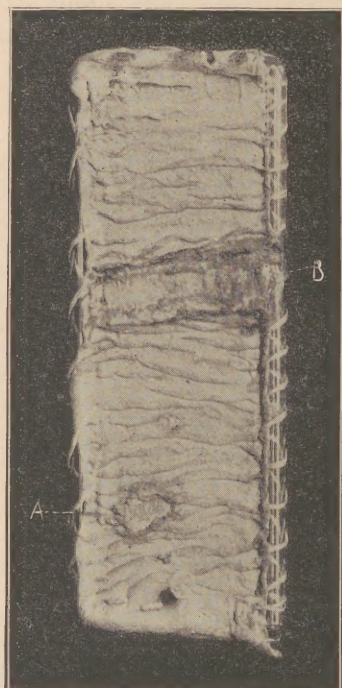


Figure 1.—Tubercular ulcer of ileum. [Pathological Museum Rush Medical College.] a, round tubercular ulcer of ileum; b, narrow circular annular tubercular ulcer of ileum.

long-standing cases, a constant concomitant pathologic condition, as was first pointed out by Schüppel and Rindfleisch. The observations occurring during operations made for intestinal tuberculosis and the



Figure 2.—Diffuse annular tubercular ulcer of ileum. [Pathological Museum Rush Medical College.]

results of postmortem examinations combine to show that retrograde metamorphosis of the inflammatory product of the tubercular glands takes place very slowly. The writer has seen repeatedly tubercular

mesenteric glands as large as a hazel-nut which had not undergone any decided cheesy degeneration. Coagulation and caseous degeneration, however, occur in the course of time, but liquefaction and abscess formation in and around tubercular mesenteric glands are of rare occurrence. Infiltration and thickening of the intestinal wall occur most frequently and reach the maximum height in cases in which the tuberculosis is located in the ileo-cecal region or colon. In these localities the disease is most frequently primary, a fact which would explain its chronicity and comparatively benign nature. When the tubercular process affects this part of the intestinal canal the resultant swelling is often of larger size and has frequently been mistaken for malignant disease. In such instances the intestinal wall has been found several centimeters in thickness.

In acute cases of intestinal tuberculosis the ulcers manifest little or no tendency to repair. In chronic cases attempts at healing or complete healing is the rule. Eisenhardt (*op. cit.*) in examining the post-mortem records of 566 cases of intestinal tuberculosis, found that healing was completed in only 10, while in 25 instances the ulcers were only partly healed.

Attempts at cicatrization are frequently seen, but very often while healing is going on in one part of the ulcer progressive infection and destruction are witnessed in another portion. The healing of a tubercular ulcer of large size requires an enormous quantity of new material, which is composed largely of new connective tissue. The scar tissue always evinces a tendency to contraction, which leads to stenosis and flexion. If the ulcer is circular, healing is attended by contraction of the lumen of the bowel, which finally leads to intestinal obstruction. If only one side of the circumference of the bowel is ulcerated, healing will result in contraction and flexion. The healing of several tubercular ulcers gives rise to the development of multiple strictures, which have been found by several surgeons in operations for intestinal obstructions. Progressive cicatricial contraction may eventually result in almost complete obliteration of the lumen of the bowel. In one of Scheuer's cases the stricture at the time the intestinal resection was performed for obstruction was so narrow that it admitted only a probe three millimeters in size. The healing of intestinal tubercular ulcers is seldom followed by complete recovery, as all such patients are liable later to intestinal obstructions and reinfection from the tubercular mesenteric and retro-peritoneal glands.

Symptoms.—Intestinal tuberculosis may run its entire course from beginning to end without any symptoms which would point to the intestinal canal as the principal seat of the disease. Tubercular ulcers of the intestines are often found at autopsies without the slightest evidence of their existence during life. That an isolated tubercular ulcer of the intestine may exist without causing symptoms before perforation occurs, is shown by a case reported by Baumgarten ("Ueber latente Tuberculose," Volkmann's *Klinische Vorträge*, No. 218). A young soldier, in almost perfect health, died suddenly of perforative peritonitis. The postmortem revealed, as the cause of the peritonitis, a solitary perforated ulcer, the size of a penny, in the lower portion of the ileum. Microscopic examination of the tissues demonstrated the tubercular nature of the ulcer. No evidence of tuberculosis was found in any other organ of the body.

In other cases the symptoms are misleading. Thus Leonhardi-Aster (Ueber einen unter dem Bilde pernicioser Anämie verlaufenden Fall von Darmtuberculose," *Deutsche Zeitsch. f. prakt. Med.*, 1878, Nos. 8 and 9) recorded a case of intestinal tuberculosis which presented all the clinical features of pernicious anemia, the intestinal symptoms being masked by the progressive anemia for which no cause could be assigned until the necropsy revealed the characteristic pathologic lesions of intestinal tuberculosis. In cases of diffuse acute intestinal tuberculosis the most important and prominent symptoms point to the existence of an intestinal catarrh. Profuse diarrhea is seldom absent, the stools being copious and liquid. Colicky pains referred to the umbilicus, slight tenderness on deep pressure, progressive emaciation and more or less rise in temperature, especially toward evening and during the night are symptoms well calculated to arouse suspicion in regard to the probable tubercular nature of the intestinal disease. Enlarged mesenteric glands can often be palpated through the thin and relaxed abdominal wall. In some cases enlarged mesenteric and retroperitoneal glands can be detected by vaginal or rectal examination. The severity of the diarrhea is attributable more to the existence of the complicating intestinal catarrh and increased peristalsis than to the ulcers themselves. Pulmonary tuberculosis, as well as tuberculosis of any other important organ, often overshadows and masks the intestinal complication. In all cases of pulmonary tuberculosis attended by diarrhea, which does not yield to the ordinary treatment, we have reason to assume the existence of intestinal tuberculosis. In primary intestinal tuberculosis the early symptoms set in insidiously, the disease is usually mistaken for an ordinary intestinal catarrh and is regarded as such until the negative results obtained from the treatment induces the physician to make a more thorough investigation of the case. The suspicions of the tubercular nature of the intestinal disease are materially strengthened if it can be ascertained that the patient has made unsterilized milk a staple article of diet.

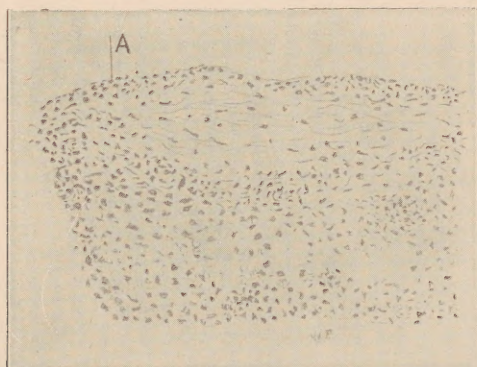
The frequent presence of traces of blood in the stools is decidedly suspicious. If the ulcers are located in the small intestine the blood is intimately mixed with the stools; if in the large intestine the extravasated blood often forms a coating for the otherwise well formed fecal masses. Pus in the stools is found, as a rule, only when the tubercular process involves the lower portion of the large intestine. In the small intestine the pus that forms on the surface of the ulcers is speedily washed away with the intestinal discharges and, on the other hand, pus formation is checked by the peptic action of the intestinal juice, which acts as an efficient antiseptic. Bamberger has called attention to the character of the stools in intestinal tuberculosis, which according to this authority frequently contain transparent particles of mucus resembling frog spawn or boiled sago grains. These masses of mucus are probably formed in and are discharged from the lymph follicles of the intestinal mucous membrane, the structures primarily affected by the tubercular process.

Virchow places less diagnostic importance on the presence of this pathologic product, which he believes has often been mistaken for partially digested starch.

The partial or complete healing of a tubercular ulcer of considerable size is usually announced clinically by the appearance of a complexus of symptoms which

indicates the existence of chronic intestinal obstruction, caused by the cicatricial stenosis which so constantly attends and follows the healing of a tubercular ulcer. Intermittent colicky pains in the umbilical region, diarrhea alternated with constipation, and perhaps occasional attacks of vomiting, are the most prominent clinical manifestations in such cases. Chronic intestinal obstruction from this, as well as other causes, often terminates in an acute attack. In rare cases, the chronic obstruction presents few or no symptoms until symptoms of acute obstruction set in, when operation or autopsy reveal the presence of an old cicatricial stenosis, which was never suspected before the abdomen was opened.

The formation of a chronic abscess in the ileo-cecal region, or any part of the abdominal wall, in connection with intestinal symptoms of long standing, always suggests the probable existence of a tubercular intestinal ulcer. The writer has always observed these in the ileo-cecal region, over the ascending colon, and in one case in the umbilical region. These are the cases in which, prior to the perforation of the ulcer, adhesion takes place, excluding the peritoneal cavity, followed by the formation of a mural tubercular abscess. In more than one case the tubercular nature of the abscess and its intestinal origin were predicted before the abscess was opened. A fecal fistula is sure to follow the opening of such an abscess. The granulations



Peritoneal tubercle showing bacilli. A, visceral peritoneum. Eye piece 4, obj. 1/12.

lining the abscess cavity may for a time prevent the escape of intestinal contents, but in the course of a few days or weeks the granulations give way and the fecal fistula appears. If the disease is attended by plastic peritonitis to any considerable extent the inflammatory exudate may often be distinctly outlined by palpation.

Voehts calls attention to a condition of diagnostic value, often met with in such cases, in the form of indurated plates in the peritoneum of almost cartilaginous hardness.

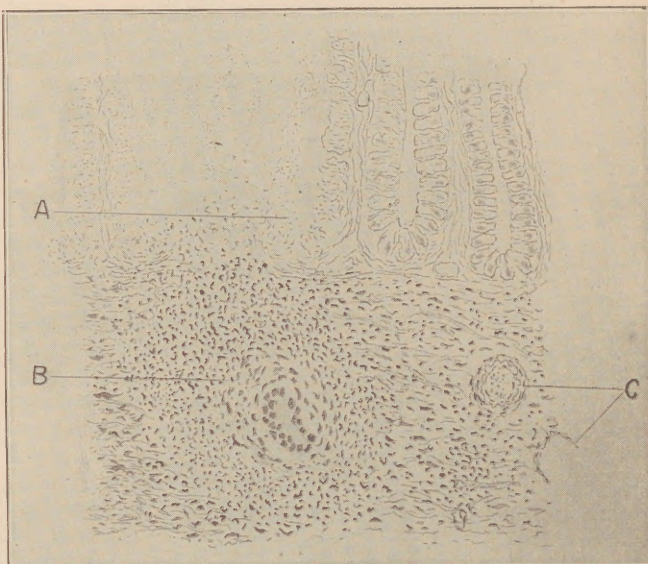
Such areas of induration are not only found in the ileo-cecal region, along the course of the colon according to the seat of the disease, but also in Douglas' fossa. In the pelvis these indurations may grow to actual exudates of considerable size, which in women might be mistaken for diseased adherent ovaries or tubercular Fallopian tubes.

In four out of six cases operated upon by Czerny a diagnosis of probable intestinal tuberculosis was made before the operation was performed. The diagnosis was based largely upon the clinical history which indicated the existence of a cicatricial stenosis in the

ileo-cecal region and the presence of a swelling, which on percussion yielded a dull tympanitic resonance, and which was movable and only slightly tender on pressure, and the periodic abdominal pains caused by exaggerated intestinal peristalsis, as described by Czerny, König and Benoit.

The anatomic location of the stricture is indicated by clinical phenomena which deserve a careful study and analysis. Stenosis of the duodenum above the entrance of the bile duct, gives rise to the same symptoms as stenosis of the pylorus, but below this point it is attended by symptoms which not only simulate the latter affection, but also obstruct the entrance of bile into the intestinal canal.

The most important condition which characterizes duodenal stenosis below the bile duct, is the constant presence of bile in the chyme and repeated ejections of the fluid by vomiting. On the other hand, of three clinical observations Boas ("Ueber die Stenose des Duodenum," *Deutsche med. Wochenschrift*, 1891, No. 28), shows that fluid taken from the stomach



Tubercular intestine. A, necrotic mucosa; B, tubercle in submucosa; C, vessels. High power.

contains not only bile but also pancreatic juice. The contents of the stomach possessed all of the chemico properties of duodenal chyme.

Duodenal differs from pyloric obstruction also by the absence of a corresponding dilatation of the stomach, by the absence of the products of fermentation of the stomach contents and by the absence of sarcinae and yeast cells. No distinction can be made between obstruction in the lower portion of the duodenum and the upper part of the jejunum. Vomiting of large quantities of bile indicate duodenal obstruction, while the ejected material assumes more and more the character of feces, the lower the location of the obstruction. In eight out of twelve cases of duodenal obstruction, collected by Gerhardt and Hagenbach, the disease was due to carcinoma, cysts or hemorrhage of the pancreas. The search for the pancreatic juice in the stomach contents is important. The number of well authenticated cases of tuberculosis of the duodenum have been placed on record, and there is no reason to doubt that in isolated cases the ulceration might heal with the usual remote conditions following cicatricial stenosis and intestinal

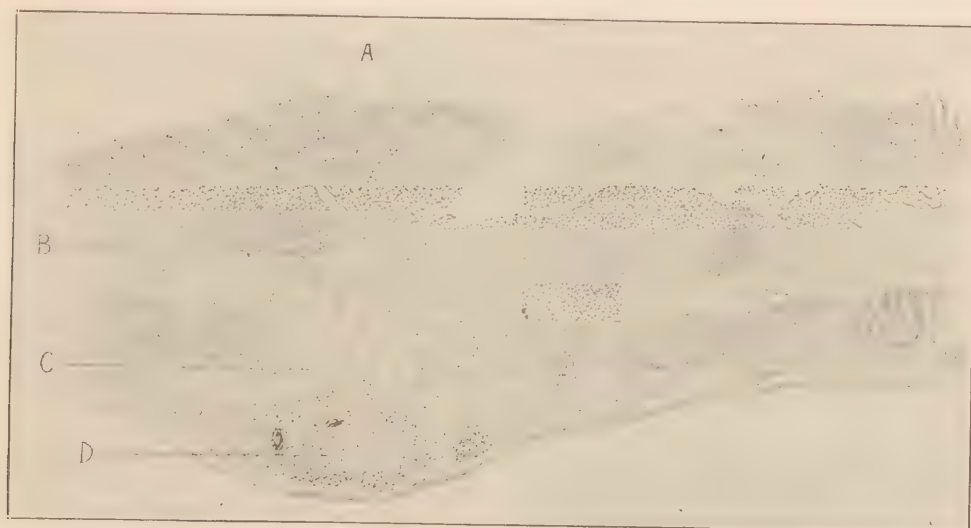
obstruction. If the cicatricial stenosis involves the ileo-cecal region, or any part of the colon, the usual symptoms indicative of intestinal obstruction in these portions of the intestinal tract, will develop. Diarrhea is the most constant symptom in such cases. In far advanced cases extensive tympanites, fecal vomiting and complete interruption of the fecal circulation at the point of obstruction complete the clinical picture of intestinal obstruction.

Diagnosis.—The diagnosis of secondary tuberculosis of the intestines presents few difficulties if the primary disease is well marked, and affects an organ readily accessible to examination. Pulmonary phthisis generally precedes and attends secondary intestinal tuberculosis. In women, tuberculosis of the internal genital organs occasionally constitutes the primary affection, and extension takes place to the intestinal canal, either through the lymphatic channels or, as in one of Czerny's cases, by rupture of a tubercular abscess into the intestinal canal. In cases of primary intestinal tuberculosis, an early correct diagnosis is seldom made. There are other ulcerative affections of the intestines which in many respects resemble

produced the chronic intestinal catarrh. Examination of the lungs and other important organs failed to locate a tubercular focus. The mesenteric glands could not be felt on palpation and rectal examination. The stools were frequent and liquid. The pain slight and referred to the umbilical and hypogastric regions.

Intestinal tuberculosis was suspected. Carbonate of guaiacol and salicylate of bismuth were administered internally and the colon was washed out daily with a copious enema of warm salt solution. On many different occasions the stools were examined for tubercle bacilli, but none could be found. Myriads of colon bacilli and micrococci were invariably found. The absence of tubercle bacilli in the stools and the marked improvement which followed the treatment, leave but little doubt that this was a case of intestinal ulceration, caused by infection with the colon bacillus.

Bacteriologic examination of the feces in suspected cases of intestinal tuberculosis should never be neglected, as it often furnishes positive proof of the tubercular nature of the disease. Tubercle bacilli, when present in the feces, in which they may be demonstrated by the same methods as in sputum, are indica-



Tubercular intestine. Low power. Cross section of ulcer. A, necrotic mucosa; B, tubercles in submucosa; C, invasion of muscular layers; D, peritoneal tubercle with giant cells.

intestinal tuberculosis. Councilman ("Johns Hopkins Hospital Reports," March, 1892) reports a case of extensive and deep ulceration of the lower portion of the ileum complicated by stricture of the rectum, which terminated in death from perforation and gangrenous periproctitis, and in which typhoid fever and tuberculosis could be safely excluded as causes. At the postmortem, ulceration of the ileum was found, with invasion of the tissues by colon bacilli. Some of the ulcers presented the appearance of an acute process, others were of a chronic nature. Numerous bacteria, both short rods and micrococci, were found in the superficial necrosed tissue, in some places extending into the cellular infiltration in the submucosa. These microbes did not seem to stand in any direct etiologic connection with the pathologic changes. The writer recently had under his observation for several months a case of chronic diarrhea, which had resisted all remedial measures. The patient was a man about 30 years of age, very anemic and greatly emaciated. No hereditary tendency to tuberculosis, and no cause could be ascertained, which might have

tive of intestinal tuberculosis, providing that they are observed upon repeated examination, and that clinical symptoms are present which point to the intestines as the seat of disease, as otherwise they may be referable to swallowed sputa.

The best way to find the bacillus is to dilute the feces with distilled water and to prepare and strain the deposit after centrifugation. Sawyer (*Medical News*, May 23, 1896) urges the importance, in cases of suspected intestinal tuberculosis, of examining the mucus collected from the rectum, just above the sphincter ani, for bacilli. When found, particularly on the surface of fissured stools, these clusters of bacilli are of diagnostic value, and may be relied on to indicate tubercular processes in the intestinal tract. He has thus found them in several cases when they could not be found in the sputum, or when sputum could not be obtained.

If the tubercular enteritis has progressed to the formation of cicatricial strictures, the differential diagnosis between intestinal obstruction from this cause and other inflammatory affections which result

in ulceration and cicatricial stenosis, is always difficult and sometimes impossible. In such cases a probable diagnosis must rest on a careful study of the clinical history and search for tubercular foci in other organs.

Congenital stricture.—Congenital stenosis of the intestinal canal may appear as a single or multiple congenital defect, may affect any portion of the intestinal canal and may cause no symptoms until long after birth. Intestinal stricture occurring in infants, children and young adults, without any history of the existence of an antecedent ulcerative lesion, is quite frequently of a congenital origin.

Traumatic stricture.—If in cases of intestinal obstruction from a stricture the clinical history shows that the patient has been for some time in the past, the subject of an injury to the abdomen it should be borne in mind that the stricture may be the direct result of the trauma. Such strictures are occasionally caused by a blow on the abdomen. Mygiud reports such a case. Intestinal resection was performed six months after the accident for symptoms of obstruction, and the patient recovered.

Traumatic strictures may result from laceration of the mucosa or from plastic peritonitis. In the former variety the lesion of the mucous membrane would be likely to simulate more closely tubercular enteritis than the peritonitis form. In both instances, however, the catarrhal enteritis complicating the chronic obstruction would present some clinical features in common with tubercular enteritis.

Stricture following strangulated hernia.—It has been known for a number of years that intestinal stricture occasionally develops after the reduction of a hernia by taxis or operation. The stricture in such cases is caused by a circular necrosis of the mucous membrane, resulting from the pressure by the strangulation. The elimination of the necrosed tissue is followed by ulceration, and the healing of the circular ulcer finally leads to cicatricial contraction and intestinal stenosis. Garré first described intestinal stricture as one of the remote results of a strangulated hernia. ("Ueber eine eigenartige Form von Darmstenose nach Brucheinklemmung." *Beiträge zur klin. Chirurgie*, B. ix.) He made the observation that in some cases of strangulated hernia the mucous membrane of the bowel at the point of constriction becomes necrotic and is cast off as a slough. The circular defect heals by granulation, and the resulting scar leads to circular constriction.

In his first case the symptoms of obstruction necessitated a laparotomy, which was performed nine weeks after the herniotomy. The patient was 27 years old, and the subject of a preperitoneal inguinal hernia. Intestinal resection to the extent of forty-one centimeters was made, and the continuity of the bowel restored by circular enterorrhaphy. The patient recovered. Examination of the specimen removed showed that the ulcerated surface had not entirely healed. At one point the ulceration extended as far as the peritoneum.

Ravault ("Rétrécissement cicatriciel de l'intestin au niveau des 2 points de l'étranglement d'une ancienne hernie," *Bull. de la Soc. anat. de Paris*, 5, Série iv) reports a case of double cicatricial stricture of the small intestine which caused death from acute intestinal obstruction. Several years before the last illness the patient was operated upon successfully for strangulated hernia. The acute attack of intestinal obstruction resulted

fatally in a few days. The necropsy revealed two strictures eight centimeters apart; the segment of bowel between them was distended by gas. Above the stricture on the proximal side the bowel was greatly distended and vascular, while the intestine below the second stricture was contracted, empty and pale. The strictures were undoubtedly the result of sloughing, ulceration and scar formation, consecutive pathologic conditions caused by harmful circular constriction by the neck of the hernial sac.

The time of the appearance of symptoms of obstruction in this form of intestinal stenosis varies from a few days to a year or more. Pitt records a case of femoral hernia in which symptoms of obstruction appeared five days after the reduction of the strangulated hernia, while in Garré's case the symptoms of obstruction did not set in until nine weeks after the relief of the strangulation by taxis.

The possibility of the existence of a cicatricial stricture due to such a cause must be remembered in cases of intestinal obstruction in which the clinical history refers to strangulated hernia relieved either by taxis or operation.

Stricture following healing of typhoid ulcer.—The healing of typhoid ulcers is very rarely followed by cicatricial stenosis. Treves made a very careful search for stricture of the intestine caused by typhoid ulcer and was able to find only one well authenticated case. Typhoid ulcers, as a rule, heal rapidly and much of the tissue destroyed is reproduced by the reparative process, leaving only a minimum quantity of connective tissue, while the healing of a tubercular ulcer is attended by the formation of an abundance of connective tissue, which subsequently undergoes progressive cicatricial contraction. The locations for the stricture are the same in typhoid and tubercular ulcers.

Syphilitic stricture.—Among the multiform visceral lesions caused by tertiary syphilis are to be noted intestinal strictures. According to Rieder ("Annual of Universal Medical Sciences," Vol. 1, D. 31) the lesions causing the obstruction are most frequently met with in the upper part of the small intestine. Syphilitic stricture is not caused by ulceration but by the production of new connective tissue in the submucosa and later in the other coats. The symptoms attending syphilitic intestinal stricture indicate the existence of a mechanical obstruction without the existence of a previous ulceration, as is the case in tubercular stricture.

Ovarian tumor.—The differential diagnosis between a tubercular stricture and intestinal obstruction caused by certain anatomico-pathologic forms of ovarian tumor is attended by many difficulties. In one of Czerny's cases of ileo-cecal tuberculosis, the swelling was mistaken for an ovarian tumor by the attending physician. Veit has shown that in women the differential diagnosis between tuberculosis of the ileo-cecal portion of the intestinal tract and ovarian tumor which has extended to the meso-cecum and mesocolon is always extremely difficult and often impossible.

Malignant stricture.—The two causes which give rise to intestinal obstructions most likely to be mistaken for each other, are cicatricial stenosis following tubercular ulcer and malignant stricture. The ileo-cecal region is the favorite locality for both of these affections. In intestinal obstruction due to either of these causes the clinical history is characterized by a

complexus of symptoms pointing to chronic obstruction, and in either case involvement of the mesenteric and retroperitoneal lymphatic glands is sure to occur sooner or later. Tubercular strictures are found most frequently in persons below middle age, while carcinoma is more likely to occur in persons of advanced age. The reverse may, however, be the case, as intes-

tinal tuberculosis may attack the aged and intestinal carcinoma may occur in young adults. The detection of a tubercular focus in another organ, and the discovery of tubercle bacilli in the stools will furnish evidences of the tubercular nature of the obstructive lesion and will exclude the probability of the existence of malignant disease.

Surgical Treatment.

Address delivered at the Meeting of the Illinois State Medical Society, at Galesburg, May 17, 1898.

The title of this paper will probably appear somewhat strange and out of place to the general practitioner and the surgeons who have not kept fully abreast with the great advancements that have been made during the last decade in the diagnosis and surgical treatment of localized lesions of the intestinal tract. Our increased knowledge of the location, nature and clinical tendencies of accessible tubercular affections has opened a wide and fertile field for successful surgical intervention. There is hardly an organ in the body which when the seat of a localized tubercular process has not been exposed and subjected to direct treatment with a fair expectation of removing or limiting the further extension of the disease. The medical treatment of tuberculosis in its various forms at the present time is not much in advance of that of fifty years ago. The numerous specifics invented and vaunted in different parts of the world have all fallen by the wayside and the old-fashioned remedies are again taking their place. Leaving out the local measures we have to rely in the treatment of such cases largely on diet, change of climate and occupation, outdoor air and the administration of those remedies known to exercise a favorable influence in improving digestion, nutrition and assimilation, and thus indirectly antagonize the ravages of the disease.

Powerless as we remain today in the successful systemic treatment of tuberculosis, it is a source of gratification to know that great improvements have been made in the local treatment of accessible tubercular lesions. The intestinal canal is one of the last territories opened up for successful surgical invasion. All the work done in this department of surgery dates back but a few years. The results obtained by the surgical treatment of localized intestinal tuberculosis are such as to encourage further effort in this direction. The number of cases operated upon so far remains a small one, and it is my intention on this occasion to bring them to the attention of the profession of this country and to describe the different operative procedures which have been employed by different operators with the same aim in view, either to remove the diseased tissue, or to render the affected portion of the bowel accessible to direct treatment, or to place it in a more favorable condition for spontaneous healing of the tubercular ulcers.

This paper will deal largely with localized primary tuberculosis of the intestinal canal, with cases amenable to successful surgical treatment. Diffuse primary tuberculosis of the intestines remains, for the present, a surgical *noli me tangere*. Surgical intervention is also contraindicated in secondary intestinal

tuberculosis in all cases in which the primary disease, usually pulmonary tuberculosis, is far advanced and constitutes in itself an imminent source of danger to life. There are, however, cases of primary intestinal tuberculosis in which timely radical measures prove successful in eliminating the disease permanently and in restoring normal intestinal digestion and absorption. The attention of the mass of the profession must be called to the necessity of a more careful and thorough examination of chronic inflammatory affections of the intestinal tract, for the purpose of making an early and correct diagnosis and with a view of selecting appropriate cases for timely surgical treatment. The internist and the surgeon must co-operate with each other in the future development of this, one of the most recent departments of the healing art.

I shall quote and describe the cases operated upon for intestinal tuberculosis under the headings of the different operative procedures:

1. *Abdominal section and iodofumigation.*—Every surgeon is familiar with the curative effects of abdominal section and drainage, with or without iodofumigation, in cases of peritoneal tuberculosis. The modus operandi of this method of treatment has never been fully and satisfactorily explained, but the fact remains that it has proved eminently successful in the majority of such cases. There is no doubt in my mind that the local application of iodoform adds to the therapeutic value of this method of treatment. In one of the cases which has recently come under the observation of the writer abdominal section and drainage were resorted to on two different occasions, but the tubercular hydrops returned. Tapping and the injection of from 7.4 to 15 c.c. of a 3 per cent. of iodoform-glycerin emulsion repeated six or eight times at intervals of from one to two weeks finally succeeded in effecting a cure, and the patient remains in perfect health, more than a year after the last tapping. Future observations will undoubtedly prove that peritoneal tuberculosis is more frequently caused by infection from primary intestinal lesions than has been heretofore supposed.

It is not strange that the same treatment should occasionally prove equally useful and efficient in certain cases of intestinal as in peritoneal tuberculosis. Nové-Josseraud ("Tuberculose localisée du cæcum traitée par la simple laparotomie," Société des Sciences Médicales de Lyon. *Lyon Médicale*, 1896, No. 22) made a laparotomy on a child 12 years old for a swelling the size of an adult's fist in the region of the cecum. The incision demonstrated the existence of extensive tuberculosis of the cecum and adjacent portions of the ileum and ascending colon. The affected parts were not interfered with, except that they were wiped gently

with iodoform gauze and dusted with a thin film of iodoform, and yet the operation was followed by a speedy and permanent recovery.

This method of treatment has a limited application in the treatment of intestinal tuberculosis when the disease is too extensive for more radical measures and no obstructive lesion is indicated by the symptoms or discovered at the time of operation. Iodofumigation and capillary drainage with iodoform gauze for a few days would seem to be indicated in such cases.

2. *Enteroplasty*.—Plastic operations are indicated in solitary circular strictures following the healing of a tubercular ulcer and constituting the cause of intestinal obstruction. In narrow circular strictures an operation similar to that devised by Heineke-Mikulicz for pyloric cicatricial stenosis will yield the most satisfactory operative and functional results. The stricture is divided on the convex side of the bowel and the incision carried sufficiently far into healthy tissues on each side of the stricture, in a direction parallel to the long axis of the bowel, and the visceral wound closed transversely by two rows of sutures of fine braided silk, thus restoring the lumen of the bowel to its normal size.

Péan (*Bulletin de l'Académie de Médecin*, Dec. 30, 1890) performed such an operation for cicatricial stenosis of the ileo-cecal valve, following the healing of a tubercular ulcer. He made the abdominal incision above and parallel to Poupart's ligament. The bowel was tied above and below the constriction with a rubber cord passed through a slit in the mesentery. The intestinal wall was incised at the level of and at each side of the strictured valve for a distance of three inches. After washing out the opened segment of the bowel with a 1 per cent. solution of carbolic acid, the cicatricial tissue was excised. This being done, the two extremities of the intestinal wound were brought together by means of forceps. The incision, which was first longitudinal, soon took the form of a lozenge, two sides of which were represented by the lips of the small intestine and the other two by those of the large intestine. Bringing the forceps nearer together the incision became transverse, and in this position the edges were sutured in the usual way. Catgut was used for the inner and silk for the outer row of suturing. The patient recovered and remained in good health at the time the report was made.

3. *Enterectomy*.—The most radical treatment of intestinal tuberculosis, in appropriate cases, is resection followed by circular suturing. Resection is indicated in isolated intestinal tuberculosis as long as the swelling is movable and the disease gives rise to symptoms of obstruction; if, however, the disease is no longer limited to the organ primarily affected, or if it is complicated by advanced pulmonary or general tuberculosis entero-anastomosis should take the place of a radical operation. Experience has shown that it is neither essential or even necessary to add to the gravity of the operation by attempts to remove the products of regional infection. After removal of the primary focus of infection the lymphatic tuberculosis usually comes to a standstill, although cases have been recorded in which later reinfections occurred from this source.

Diffuse glandular tuberculosis in such cases is beyond the reach of safe surgery. Caseous glands in the mesentery, corresponding with the portion of the intestine excised, should be removed by including the mesentery in the excision. So far excision has

only been performed in cases in which the tubercular lesion gave rise to intestinal obstruction. The results of this operation will be greatly improved in the future when intestinal resection will be performed as soon as a localized tubercular lesion can be diagnosed, and before the patient's general condition has been seriously impaired by the mechanical obstruction.

Intestinal resection has been most frequently performed for tuberculosis in the ileo-cecal region. A number of cases, however, have been recorded in which the seat of the disease was the small intestine. Dr. Rudolph Matas made a successful enterectomy for intestinal stricture, following the healing of a tubercular ulcer involving the upper portion of the jejunum. The patient made a rapid and permanent recovery. (Personal communication.)

König ("Die stricturirende Tuberculose des Darmes und ihre Behandlung," *Deutsche Zeitschrift f. Chirurgie*, 1892, B. xxxiv, p. 62) reports five cases of stricture of the intestine caused by cicatricial contraction of tubercular ulceration, all treated by laparotomy and resection of the intestine with circular enterorrhaphy. Two of the patients died; one from exhaustion, the other from the giving way of a suture, an accident which resulted in leakage and diffuse peritonitis. He believes that this pathologic form of cicatricial stenosis is much more frequent and more easily recognized than has hitherto been thought. He has met with this affection most frequently in persons between 20 and 30 years of age, and especially in those suffering from other tubercular lesions. He has made a careful investigation of such cases and found that the clinical history usually reveals a chronic cause, frequent attacks of colic with constipation, tympanites, visible peristalsis and peculiar splashing and musical sounds, ending with a sound which resembles that of fluid driven forcibly from a syringe. The disease invariably produces great emaciation and anemia. In spite of the feebleness of the patients, König thinks surgical interference advisable, especially as the ulceration is probably still progressing in part of the cicatricial contraction and often the tubercular disease elsewhere is not far advanced.

Treves ("Resection of Intestine," *The Lancet*, Jan. 4, 1896) made a resection of the intestine for tubercular stricture and united the bowel ends by the use of Murphy's button. The patient made a satisfactory recovery.

Sachs (*Archiv für klin. Chirurgie*, 1892, B. 43), reports the following case of resection for intestinal tuberculosis: A woman, aged 41, had suffered for a long time from constipation, and for two years had had loss of appetite and gradually increasing marasmus and debility. On examination a hydronephrosis of the right kidney was discovered, and also a swelling in the right iliac fossa, which was supposed to be of a malignant nature. Laparotomy was performed when the right iliac fossa was found to be filled up by a hard swelling, which was the size of an adult's fist. Surrounding the ileum was a band of contracted fibrous tissue with tubercular granulations in some places. The diseased parts were resected and the two ends of the intestine joined together by circular enterorrhaphy. The patient recovered and was in a satisfactory condition several weeks after the operation. On examination of the specimen removed the ileum was seen to be surrounded by a band of scar tissue and granulations. At the junction of the ileum with the cecum there was a large tubercular mass, which extended to

the mesenteric glands. The mucous membrane of the cecum was replaced by tubercular granulations, which extended into the muscular coat, and on microscopic examination were seen to consist of epithelioid and giant cells. He collected thirteen cases of resection of the ileo-cecal portion of the intestinal canal for tuberculosis, of which eleven recovered.

Zahlmann (*Hospitals Tidende* 1892, No. 36) reports a case of tubercular stricture of the intestines removed by Tage Hansen of Denmark. The patient, a girl, aged 17 years, had been previously treated for tuberculosis of the phalanges of the fingers and toes. For one and a half years she had exhibited signs of stricture of the intestines, and at the laparotomy the entire cecum, with the adjacent parts of the ascending colon and ileum, was found to be the seat of an inflammatory mass which had produced a stricture an inch and a half in length, of a diameter corresponding to that of a lead pencil, while the walls were nearly an inch in thickness. Six inches of the ileum, the entire cecum and four inches of the ascending colon were removed. The healthy ends of the ileum and colon were united by means of Lembert's sutures, the difficulty in adapting the different lumina to each other being overcome by dividing the ileum by an oblique section at the expense of the convex side. The patient recovered and remained in good health at the time the report was made six months after the operation.

Of five cases of intestinal tuberculosis in which the cecum and colon were the seat of disease, and in which Czerny resorted to resection and circular suturing, two died of peritonitis and one of hemoptysis after complete recovery from the operation. In one case the peritonitis was caused by leakage through one of the needle punctures, and in the second the perforation occurred in consequence of abscess formation in the line of suturing. The patient died from the effects of peritonitis, septic pyemia and metastasis, five weeks after the operation. In one case the operation proved successful, but was followed by rapid generalization of the tubercular process, an observation fully corroborated by Wahlländer and Wolff, who have called special attention to the diffusion of tubercular processes after intervention for what appeared as localized processes. In one case of secondary tuberculosis, following rupture of a tubercular adnexal abscess into the intestine, circular suturing after excision was found impossible and consequently an artificial anus was established with an excellent functional result. Among the cases operated upon by Czerny, and reported by Rindfleisch ("Ueber die an der Heidelberger Chir. Klinik ausgeführten Operation am Magen und Darne." *Beiträge zur Klin. Chirurgie* B. ix, p. 661), are several in which the remote results of operations for intestinal tuberculosis have since been ascertained. In the case of a woman, 34 years of age, operated upon in 1886, nothing definite could be learned as to the subsequent history. In the case of an ileocecal resection performed in 1888, on a man 30 years of age, death resulted three years later from pulmonary tuberculosis. The postmortem revealed tubercular ulcers in the colon and small intestines, with miliary tubercles on the peritoneal surface and cheesy mesenteric glands. No information could be had in the case of a man, 54 years of age, subjected to ileo-cecal resection, but the operation appeared to have exerted no influence in checking the progress of the pulmonary affection. A man, 26 years old, died of pulmonary tuberculosis two years after the operation. A woman,

22 years of age, was in good health four years after the operation. A man, 31 years old, was found in excellent health four years after the operation, having gained during this time twenty-three pounds in weight. This patient suffered only occasionally from catarrh of the colon, the attacks being of short duration. These cases go to prove that resection for intestinal tuberculosis in well selected cases yields satisfactory remote results, while the reverse is true if the operation is performed under adverse conditions.

Rentier ("Cæcum provenant d'une résection iléo-sacrale pour tuberculose." *Bulletins et Mémoires de la Société de Chirurgie*, 1896, No. 7) resected the entire cecum for tuberculosis and united the bowel ends by means of Murphy's button. Death occurred on the sixth day after the operation. The lumen of the button, which remained *in situ*, was completely blocked by feces. Additional tubercular ulcers were found in the jejunum.

Caminiti-Vinci (*Riforma Medicina*, July 11, 1896) reports the case of a man, aged 24, without any tubercular family history, who for the last nine months had suffered from severe pain in the left superior quadrant of the abdomen, aggravated after meals; no diarrhea or vomiting. In the affected region an ill defined swelling could be felt, descending slightly with inspiration, rather painful on palpation. The patient, not improving under medical treatment, was operated upon March 8, 1896. The omentum was found thickened, hard and adherent to the small intestine for about ten centimeters; this was excised, and also about thirty centimeters of the intestine itself, with its mesentery and glands. The bowel was united by circular suturing. The patient recovered and remained in good health four months after the operation. Macroscopic and microscopic examination proved the tubercular nature of the disease in the parts removed.

Courtillier ("Tuberculose chronique de l'angle ileo-cæcal. Resection, Enterorrhaphie, Guérison, Fistule pyo-stercorale, Operation, Mort, Autopsie." *Bulletin de la Société Anatomique de Paris*, 1896, No. 13) reports the case of a boy, 12 years old, operated upon by Broca for tuberculosis of the cecum. The entire cecum was resected and the ileum united with the ascending colon by circular suturing. The patient recovered from the operation and remained in perfect health for three years, when a fecal fistula appeared at the site of operation. Operation for closure of the fistula was followed by death. The autopsy showed the small intestine in a perfectly healthy condition, but the disease had reached the ascending colon and was complicated by tuberculosis of the left lung.

Durante ("Resezioni intestinali per tubercolosi del ciccio." *R. Acad. Medica di Roma*, No. 4, 1895) has resected the cecum for tuberculosis five times. He calls attention to the difficulties presented relative to making an early diagnosis. Intermittent diarrhea for two to six years is a conspicuous and almost constant symptom. For a long time the general health is not much impaired. Symptoms of progressive cicatricial stenosis finally appear. In one case he was able to ascertain from examination of the specimen that the tubercular process had its primary starting point in the appendix. Of the five cases four lived and were in good health five to seven years after the operation. In one case relapse was due to incomplete removal of the infected tissues. He regards the prognosis as favorable after a complete extirpation of the affected portion of the intestine.

Emil Müller ("Extra-abdominal Tarmresection mid fortsatz; Extra-abdominal Behandling, *Hospitals Tidende* No. 3, 1896) resorted to resection in two cases of tubercular stricture of the intestine. In the first case the disease extended over the lower part of the ileum, cecum and ascending colon to within an inch of the right colic flexure. In the second case, the operation was performed extra-peritoneally. After opening the abdomen by lateral incision the colon was made movable by incising the external layer of the meso-colon, when the diseased portion of the intestine was brought forward into the wound. The inner layer of the meso-colon was sutured to the inner margin of the incision and the peritoneal cavity on the outer side of the bowel was shut out with an iodoform gauze tampon. After six days the affected portion of the intestine was extirpated extra-peritoneally. The continuity of the intestinal canal was restored by circular suturing, which could be done without invading the excluded peritoneal cavity. The external wound was sutured and drained. The patient recovered rapidly, without any untoward symptoms and was discharged from the hospital with his health restored.

To what extent operative procedure can be carried in true cases of intestinal tuberculosis with ultimate recovery is well shown by a case reported by Körte (*Verhandlungen der Deutschen Gesellschaft für Chirurgie*, 1894.) The patient, a man, 25 years old, was operated upon in 1891 for acute suppurative peritonitis. The following year, March 16, the appendix was removed. In August, of the same year, a swelling developed along the course of the cecum and ascending colon. August 27, the cecum and ascending colon, nearly as far as the hepatic flexure, were excised. Healthy tissue was not reached. An artificial anus was established. The microscope demonstrated the tubercular nature of the intestinal affection. The enterotome was used without any benefit. In November, twenty-one centimeters of the colon was resected. The end of the colon was invaginated and sutured and an entero-anastomosis established between the colon and the lower portion of the ileum. A fecal fistula followed the operation. In February, 1893, Diffenbach's enteroplasty was performed, but proved unsuccessful. In May, a loop of the small intestine was implanted into the sigmoid flexure. For two weeks there were normal evacuations per rectum, then a fecal fistula formed. July 3, what was left of the colon was permanently and completely excluded by closing both ends. Regular evacuations by rectum followed. July 23, the excluded colon was resected. Patient recovered. Subsequent treatment was with iodoform gauze packing. The fecal discharge from the fistula was always liquid, but as soon as it passed through what remained of the colon the stools became natural. Only one case of resection for intestinal tuberculosis has come under my own observation.

Tuberculosis of the cecum and ileum; resection of cecum and eighteen inches of the ileum with corresponding portion of mesentery. Restoration of continuity of intestinal canal by lateral anastomosis with the aid of decalcified bone plates. Recovery; return of the intestinal affection and death six months after operation.—The patient was a spare man of medium height, 37 years of age, and a farmer by occupation. He is unaware of the existence of any hereditary taint or predisposition to tuberculosis or malignant disease in the family. His health was excellent prior to Aug. 16, 1887. On that day he was taken suddenly ill with an attack of vomiting, without any obvious cause, which lasted for six hours. The patient insists that toward the last he vomited fecal matter. He recovered rapidly and remained in comparatively good health until

the following October, when he suffered from a similar attack of four hours duration. This time he experienced a sharp pain in the ileo-cecal region, and soon after felt a distinct swelling in that locality. From this time on until March, 1889, the pain recurred periodically, the intervals becoming shorter until pain became almost continuous with few and incomplete remissions. During this time he suffered also a great deal from flatulence. The bowels were inclined to be loose, but the general health was not seriously impaired. Since March, 1889, diarrhea became a prominent symptom, the stools being liquid, but showing no trace of blood or mucus. Pain increasing in severity and more constant, and always partially relieved by the free escape of gas per rectum. At the time he entered the hospital (Oct. 9, 1889), he had lost forty-five pounds in weight. Examination at this time revealed the existence of a hard, nodulated, fixed swelling in the ileo-cecal region, and tympanites in the hypogastric and umbilical regions. Distention of the colon by rectal insufflation of hydrogen gas made the swelling more prominent and defined. Not much tenderness on pressure. Digital exploration of the rectum yielded a negative result. Marasmus and anemia were well marked. For the last seven months the patient has had daily from four to six liquid discharges from the bowels. Appetite is impaired, slight rise in the evening temperature, pulse from 80 to 90 per minute. From the history of the case, and more especially from the character and location of the swelling, a probable diagnosis of tuberculosis of the cecum was made. As the usual medical treatment, which had been pursued for months, afforded but temporary relief, the consent of the patient and his friends to an operation was readily obtained. Laparotomy was performed on the day of his admission into the hospital. The abdomen was opened by an incision from near the middle of Poupart's ligament to a point half way between the anterior superior spinous process of the ileum and umbilicus. On opening the abdomen the swelling at once came within easy reach. Examination showed that the swelling involved the entire circumference of the cecum, and its immobility suggested that it was intimately connected with the retroperitoneal tissues by inflammatory adhesions. The lower portions of the ileum and cecum were emptied by displacing their contents, and each part was entrusted to an assistant, who was instructed to prevent fecal extravasation by digital compression, until the completion of the anastomosis. The ascending colon was divided about two inches below the margin of the swelling and the ileum near its junction with the cecum; both sections showed that the visceral incisions had been made through healthy tissue. The bleeding vessels were tied with fine silk ligatures. Several large partially caseous glands were found in the retroperitoneal space behind the cecum and enucleated in one large mass with the cecum and a portion of peritoneum, which was adherent to the glands. After the removal of the cecum it was noticed that the mesentery of the lower portion of the ileum contained several enlarged glands, consequently, after preliminary ligation, it was excised with eighteen inches of the ileum. During the whole operation a small compress was kept in the abdominal cavity to prevent prolapse of the small intestines, and to guard against infection. After all hemorrhage had been carefully arrested, both ends of the bowel were closed by invagination and a few stitches of the continuous suture; the first stitch was made to transfix the mesentery at the point where it was invaginated into the bowel. Medium sized perforated decalcified bone plates were used in making the ileo-colostomy, by lateral approximations. An incision about two inches in length near the closed ends of both intestines was made at a point opposite the mesenteric attachment, and into each opening a bone plate was inserted, and the lateral sutures, armed with a needle, were passed about an eighth of an inch from the margin of the visceral wound, from within outward and in such a way as not to include the peritoneum, at a point half way between the angles of the wound. The surfaces of the bowel corresponding to the part covering the plates were freely scarified with an ordinary sewing needle. The visceral wounds were now brought *vis à vis* in such a manner that both closed ends were directed downward, bringing in this way the free surface of the colon and ileum together. Before any of the plate sutures were tied, a number of Lembert sutures were applied posteriorly, so as to approximate the serous surfaces along the margin of the plates, thus affording additional security in maintaining coaptation. The posterior pair of approximation sutures was now tied with sufficient firmness to hold the parts in contact without sufficient pressure to cause gangrene, after which both pairs of sutures not armed with needles were tied. During the tying of these sutures it is of the greatest importance that an assistant should keep the plates accurately and closely pressed together. The last to tie was the second anterior pair of trans-

fixion sutures, and as this was being done the bowel on each side was carefully pushed in between the plates with a probe. After all the approximation sutures were tied, it only remained to apply on the anterior side a few Lembert sutures. After the exposed parts were disinfected and dried, the bowel was returned into the abdominal cavity and anchored near the wound with a silk suture, which was made to embrace the parietal peritoneum on one side and the mesentery on the other, at a point opposite the anastomotic opening. The abdominal incision was sutured throughout, no provision was made for drainage. The subsequent history of the case was uneventful. The highest temperature registered was on the third day when it reached 101.5 degrees F., but returned to normal on the fourth day. During the first two days liquid food was administered by rectum. After that time the patient was allowed milk, beef tea and raw eggs, and after another week he was given the ordinary hospital diet, which he relished. The bowels moved several times a day, the passages gradually becoming normal in color and consistence. The external wound healed by primary intention with the exception of a small place where a stitch abscess formed at the end of the first week. At the ninth day half of the plate in the colon passed per rectum, and the following day the remaining half, with the plate from the ileum with the sutures attached, were found in one of the stools. The patient left his bed on the twenty-eighth day after the operation, and three days later he returned to his home. At the time he left the hospital nothing abnormal could be felt in the right iliac fossa, no pain and no tenderness on pressure. He gained rapidly in flesh and strength, and when I saw him again, during the latter part of January, 1890, he weighed nearly as much as before he was taken ill. Since the operation he has had no pain, no diarrhea, and the discharges from the bowels once or twice a day were normal in every respect. At this time, however, I was able to detect a small hard swelling behind the colon at a point above where the ileum had been attached, which I regarded as a recurrence of the disease along the chain of lymphatics behind the peritoneum, but no evidence of a return of the disease in the bowel could be found. In the course of a few months the patient died from the effects of the recurrent disease without any symptoms of obstruction.

I have had reason to regret that I did not resort to a second operation as repeated operations in similar cases have finally succeeded in eliminating the disease. The specimen removed represents the entire cecum, a number of cheesy mesenteric and retroperitoneal glands, eighteen inches of the ileum with the corresponding mesentery. A few small tubercular ulcers were found in the lower portion of the section of the ileum removed. The tubercular process had evidently started in the cecum which it involved in its entire circumference. The walls of the cecum had become greatly thickened by the infiltrations. The lumen of the ileo-cecal valve was not larger than an ordinary lead pencil, and the interior of the cecum, near the valve, presented a number of deep excavations resulting from the breaking down and ulceration of the tubercular mass. The ileum for a considerable distance was the seat of a well marked compensatory hypertrophy, the thickening of its walls being due to an increase in muscular fibers, a result which so constantly follows progressive intestinal stenosis. The presence of numerous caseous mesenteric and retroperitoneal lymphatic glands, the character of the ulcers and microscopic examination of the diseased tissues removed, proved the tubercular nature of the inflammatory process. Although in this and some other cases the use of decalcified bone plates proved satisfactory in establishing a lateral anastomosis, I have discarded largely this and similar mechanical aids in intestinal surgery and have learned to rely on suturing in all cases in which there are no contraindications presented to this method of dealing with intestinal wounds.

From the accumulated experience of the past in the treatment of intestinal tuberculosis by resection, it becomes evident that this operation is indicated in all

cases in which the disease is sufficiently circumscribed to admit of complete removal, and the general condition of the patient is such as to entitle us to the hope that the operation will not prove fatal by its immediate effects. It is in such well selected cases that enterectomy will find far better results than any other operative procedure, as it has for its object the complete eradication of the disease, thus protecting the patient against reinfection from this source.

Partial physiologic exclusion of affected portion of intestinal canal by entero-anastomosis.—Ten years ago I made a series of experiments on the lower animals for the purpose of demonstrating the value of partial physiologic exclusion of the intestine by entero-anastomosis in the treatment of certain localized affections not amenable to resection. The results of the experiments proved that the excluded portion undergoes atrophy and is placed in a condition approaching physiologic rest. In none of the experiments did the excluded portion become the seat of fecal accumulation.

In the introduction to this part of the paper on "Experimental Intestinal Surgery," I said: "As extensive resections of the intestine are always attended by great risks to life from trauma, I concluded to study the subject of sudden deprivation of the system of a more or less extensive surface for digestion and absorption, by eliminating or diminishing the cause of death from this source, by leaving the intestine, but by excluding permanently a certain portion from participating in the functions of digestion and absorption; in other words, by resorting to physiologic exclusion. These experiments were also made to determine the tissue changes which would take place in the bowel thus excluded, and to learn if under such circumstances accumulation of intestinal contents would take place and constitute a source of danger, as had been feared by the older surgeons."

The results of the experiments, as well as clinical experience since that time, have shown conclusively that this fear is unfounded. In speaking of the results of the experimental work and its application in intestinal surgery, the following statements were made in the same paper: "The exclusion was complete, or nearly so, hence we must conclude from the postmortem appearances, that in nearly every instance the excluded portion presented an absorptive, contracted condition, and was only sparingly supplied with blood vessels. From a practical standpoint these experiments teach us that a limited portion of the intestinal canal can be permanently excluded from the processes of digestion and absorption in proper cases, by operative measures without incurring any risk of fecal accumulation in the excluded part. These experiments demonstrate also that physiologic exclusion of a certain portion of the intestinal tract is a less dangerous operation than excision, and that in certain cases of intestinal obstruction where excision has heretofore been practiced, it can be resorted to as a substitute for this operation in cases where excision is impracticable or where the pathologic conditions which have caused the obstruction do not, in themselves, constitute an intrinsic source of immediate or remote danger to life. The postmortem appearances of the specimens of these experiments tend to prove that as long as any of the contents of the intestines reach the excluded portion, the peristaltic or antiperistaltic action in that part is effective in forcing it back into the active current of the fecal circulation."

Since that time entero-anastomosis has become a well established operation, and has proved of signal success in the treatment of limited intestinal tuberculosis complicated, as it so often is, by cicatricial stenosis. The operation effects two desirable objects in the treatment of such cases. 1, it relieves the symptoms of intestinal obstruction; 2, it secures rest for the part affected. I have had an opportunity to perform entero-anastomosis in two cases of intestinal tuberculosis.

Intestinal tuberculosis complicated by acute intestinal obstruction caused by cicatricial stenosis; ileo-ileostomy; recovery; patient in almost perfect health two years after the operation.—The patient was a boy 16 years of age, member of a healthy family, free from any predisposition to tuberculosis or malignant disease. He had never been seriously ill and was in the best of health, weight 140 pounds when he was attacked with colicky pain, which he referred to the umbilical region, December, 1895, which continued for two days. He recovered from this attack and remained in fair health until Dec. 18, 1896, when he was again seized with fever pains in the abdomen of a colicky nature, which continued until he entered the hospital. Bowels had not moved for two days prior to his present illness. Vomiting which soon became fecal, and absolute constipation followed by great tympanites came on in rapid succession. The attending physician made a diagnosis of intestinal obstruction and resorted to the usual treatment including the use of high rectal enemata with little or no relief. When he was admitted into the St. Joseph's Hospital, March 1, 1896, he had lost forty pounds in weight. He was very anemic and the emaciation was pronounced. The abdomen was enormously distended, visible intestinal coils could be distinctly outlined. Temperature was normal, pulse small, 100 per minute. There had been no free movements from the bowels since the attack; frequent attacks of vomiting, at times fecal in character. Rectal examination yielded no information regarding the anatomic location or nature of the obstruction. The day after his admission into the hospital, after thorough preparatory treatment, laparotomy was performed. The abdomen was opened in the median line, half way between the umbilicus and pubes. Intestinal coils, enormously distended and exceedingly vascular, protruded at once from the wound and were carefully protected with compress wrung out of a hot physiologic solution of salt. One of the first things noticed was the existence of numerous enlarged mesenteric glands. Some of them were the size of a hazel nut and presented distinct evidences of beginning caseation. The visceral as well as the parietal peritoneum was studded with innumerable tubercle nodules. The existence of peritoneal and glandular tuberculosis was at once made evident. In searching for the seat of the obstruction the distended intestine was traced in a downward direction, the intestinal loops being replaced as soon as examined so as to prevent extensive eversion. In reaching the lower part of the ileum, the obstruction was found about twelve inches above the ileo-cecal junction, in the form of a tight circular stricture. Above this point the intestine was uniformly distended, very vascular, while below the obstruction the intestine was empty, contracted and pale. An ileo-ileostomy was made by establishing an anastomotic opening between the lower part of the distended ileum and that part of the ileum between the obstruction and the cecum. Before the visceral incisions were made the serous surfaces of the convex side of the intestinal loops, which were to be united, were sutured together with a row of Lembert stitches, extending a little beyond the intended limits of the incisions. On incising the proximal, distended loop the bowel was drawn well forward, the patient placed on his right side and as much of the intestinal contents as could be poured out was evacuated through the incision. After incising the empty loop to the same extent the mucous membrane was sutured all around and finally a row of anterior serous stitches completed the operation. The parts exposed were thoroughly cleansed, dried and lightly dusted with iodoform, after which the intestines were returned and the external incision closed in the usual manner. The patient recovered promptly from the immediate effects of the operation. The incision healed by primary intention throughout. The bowels moved freely the day after the operation. The tympanites diminished rapidly and disappeared entirely in the course of a week. For a few days the stools were copious and liquid, later once a day and normal in color and consistence. Rectal feeding was continued for four days, later liquid food by the stomach, followed by solid food at the end of the first week. The patient left the hospital in

excellent condition, March 30, 1896. A letter from his physician received recently, states that he is in perfect health, having gained twenty-seven pounds in weight two years after the operation.

Careful search for tuberculosis in other organs was made but proved negative. The tubercular nature of the intestinal affection in this case was obvious from the simultaneous existence of peritoneal and lymphatic tuberculosis. The entero-anastomosis relieved the obstruction promptly and placed the affected organs in a condition for spontaneous healing of the tubercular lesions. The patient was placed upon the prolonged internal use of guaiacol, which may have contributed to the remarkable result of the operation.

Tuberculosis of the cecum and ascending colon, complicated by tuberculosis of the urinary organs; ileo-sigmoidostomy; death forty eight hours after operation from exhaustion.—The patient was a man 38 years old, who was admitted into the Presbyterian Hospital Nov. 6, 1897. His health began to decline four years ago, when symptoms of chronic cystitis developed. For a long time the urine contained pus and at times blood. In February, 1896, he had a chill followed by fever and pain in the region of the right kidney. A swelling developed below the costal arch on the same side and soon reached as far as the crest of the ilium, and to within an inch or two of the median line on the left. The temperature ranged between 102 and 104 F. for five days. A second chill occurred a few days later followed by slight jaundice, which continued for a few days. The swelling was diagnosticated as an abscess, which was incised in front at a point half way between the last rib and crest of the ilium. On cutting through the abdominal wall the distended kidney presented itself and was incised, and about a pint of pus escaped. The cavity was washed out and drained. For some time urine escaped through the drainage opening. Three weeks after the operation feces escaped through the opening and the fecal fistula has remained since that time. At the time the patient entered the hospital he was very anemic and greatly emaciated. Examination of the bladder and prostate left no doubt that both of these organs were the seat of a tubercular affection. Through the fistulous opening a probe could be inserted into the ascending colon. Gas and fecal material escaped through the opening daily. Action of bowels irregular, diarrhea and constipation alternated with each other. From the cecum in the course of the colon a resistant swelling could be felt, which extended somewhat above the fistulous opening. Examination of the lungs revealed a limited infiltration in the left apex. A slight rise in the evening temperature was almost a constant feature. The fistulous opening externally was enlarged and a large cavity found between the skin and abdominal muscles, which was lined with fungous granulations. These were scraped out with a sharp spoon and the cavity thoroughly disinfected and packed with iodoform gauze. This and the subsequent operations were performed in the clinic of Rush Medical College. The scraping out of the cavity was followed by increased fecal discharge and in a short time the fistulous opening in the colon was large enough to insert the tips of two fingers. Carbonate of guaiacol and tonics were administered internally, but the patient continued to lose strength and flesh. Owing to the existence of formidable complications and the extent of of the intestinal affection I decided to exclude the cecum and colon, as far as the sigmoid flexure, from the fecal circulation, by performing ileo-sigmoidostomy.

After making careful preparation the operation was performed Dec. 20, 1897. The abdomen was opened in the median line. The cecum and ascending colon, nearly as far as the hepatic flexure, were found imbedded in an extensive exudate. Numerous enlarged lymphatic glands especially in the meso-ecum and mesentery of the ascending colon. The anastomotic opening was established between the ileum, about eighteen inches above the cecum and the sigmoid flexure. The operation was performed in a similar manner as in the case of lateral anastomosis after excision with the exception that no bone plates were used, the visceral wounds being united by two rows of sutures. The operation was completed in less than an hour. Very little shock followed. The next day, however, vomiting and symptoms of prostration set in, the pulse became more rapid and feeble, but the temperature never exceeded 100 F. Death occurred forty-nine hours after the operation.

The clinical history in this case points to primary tuberculosis of the urinary organs followed by intestinal and, later, pulmonary tuberculosis. A number

of cases have been reported in which entero-anastomosis was performed for intestinal tuberculosis. Hofmeister ("On Multiple Stenosis of the Intestine of Tubercular Origin," *Beiträge zur Klinischen Chirurgie*, B. xvii, No. 3) reports a case of multiple tubercular strictures of the intestine treated by establishing an entero-anastomosis. The patient, a man aged 32, had suffered for four years with attacks of colic accompanied by vomiting and constipation, recurring at intervals of greater or less length, the last seizures had been particularly severe. Finally the patient was taken to the surgical clinic of Bruns, at Tübingen, with all the symptoms of a marked intestinal obstruction. The operation, which was undertaken without delay, revealed ten annular strictures of the small intestine, for the most part, very narrow and distributed over two meters of the bowel. The large intestine was absolutely empty and contracted. Resection being out of the question on account of the debilitated general condition of the patient an anastomosis was made between the intestines above and below the seat of obstruction. At the very outset the distended intestine was punctured with a small trocar, to evacuate its contents. The puncture was closed with two rows of sutures. The patient was temporarily improved by the operation, but died the following day in sudden collapse. The autopsy revealed the fact that death had been caused by a general peritonitis. Inspection showed that the sutures inserted for the purpose of closing the puncture-opening were insufficient to resist the intra-intestinal pressure by gas, and had given way, followed by fecal extravasation. Besides the ten discovered at the operation, two additional strictures were found, one near the ileo-cecal valve and the other a little higher up. When the strictures are multiple the disease usually involves the ileum. Hofmeister found records of eighteen cases of multiple strictures of the intestines of a tubercular nature.

Murwedel ("Ueber Entero-anastomosis," etc. *Beiträge zur Chirurgie*, B. xiii, Heft 3) reports a case of tuberculosis of the cecum treated by entero-anastomosis from Czerny's clinic. The patient was a man, 43 years of age. No hereditary predisposition to tuberculosis in the family. He suffered from two attacks of localized peritonitis, probably caused by appendicitis, the first in 1870, the second in 1887. Since last attack pain and tenderness in the right iliac fossa remained. In 1891, the pain increased, attended by colicky pains in the abdomen, the latter disappeared after two or three minutes under a loud pouring sound. Bowel movements were irregular. A few weeks before his admittance into the clinic eructations and transient vomiting returned. He was treated for some time in the medical clinic, by high enemata without any benefit. He was admitted into the surgical clinic, August 17, 1893. At this time with the exception of a chronic conjunctivitis, rhinitis and pharyngitis and a slight pulmonary emphysema, the general health of the patient did not appear to be much impaired. Cecal region was prominent, and to the right of the cecum and ascending colon, particularly the latter, a hard cylindrical swelling could be felt, extending from the iliac spine to the tip of the eleventh rib. The swelling was fixed and tender on pressure, there was visible peristalsis of small intestines near cecum.

Clinical diagnosis: Stenosis and tumor formation in the region of the cecum and ascending colon, chronic

inflammatory (perhaps tubercular) process. First operation, Aug. 20, 1893. Vertical incision in the linea Spigellii showed infiltration of pre-peritoneal tissues and firm adhesions between anterior abdominal wall and ascending colon. In separating the adhesions an ulcerated portion of the colon near its middle was torn and a quantity of pus but no fecal material escaped. From this opening digital exploration showed that the colon was ulcerated as far as the ileo-cecal valve, which induced the operator to abandon all thoughts of performing a resection. The tear in the bowel was sutured and an entero-anastomosis made. The lower portion of the ileum was distended and hypertrophied, on the other hand the transverse colon contracted and atrophied. These two parts of the intestinal canal were then brought into communication by establishing, by incision and suturing a free anastomotic opening. The sutured wound of the colon was fastened to the abdominal wall with two peritoneal sutures. External incision was closed with the exception of a space over the cecum to secure drainage, which was effected by using the iodoform gauze tampon. The diagnosis made at this time confirmed the previous suspicion of the tubercular nature of the affections. Bowels moved on the second day after the use of an enema. A week after the operation some fecal matter was mixed with the discharge from the wound. When the patient was discharged, four weeks after the operation, the wound was healed, with the exception of a fistula, which discharged a small quantity of pus, but no fecal material. Bowels moved without the aid of cathartics or enemata. General conditions much improved. During the fall of the same year, he was attacked with influenza and at the termination of the illness the parts around the fistula became inflamed and soon after, a more copious flow of pus ensued, which became mixed with feces. He re-entered the clinic Nov. 31, 1893. The swelling in the cecal region was smaller but firmer than at the time of operation. There was constipation, which when relieved by cathartics, was followed by diarrhea, some of the fecal material escaping through the fistula. At this time the fistulous tract was enlarged with the knife sufficiently to enable exploration of the abscess cavity with the finger. The cavity was about the size of a walnut, partly filled with hard fecal masses and lined with tubercular granulations. Curettage and iodoform gauze tamponade were used. After operation nearly all of the feces escaped through the fistula. Third operation was performed December 7 of the same year. The old scar was incised and the adherent ascending colon separated. During this step of the operation a small subcutaneous abscess was opened. The fistulous opening was next exposed and was found near the lower end of the ascending colon, where a defect was found large enough to admit the tip of the index finger. Exploration of the interior of the cecum revealed a large cicatrized surface. The margins of the intestinal fistula were vivified and the opening closed with two rows of sutures, the operation being entirely extra-peritoneal. The external incision was closed with the exception of a space large enough to bring out the iodoform gauze tampon. No unfavorable symptoms followed the operation. Normal stool after injection on the eighth day. Patient left the hospital with a small fistula on the last day of the same month, almost in perfect health and with normal bowel movements. One year later the fistula still remained

and at times small quantities of feces escaped, otherwise the patient was in good health and had gained twenty-three pounds in weight. Czerny attributes the healing of the extensive tubercular ulcerations to the elimination of the affected part of the bowel from the fecal circulation by the ileo-colostomy. Schiller reports three cases of intestinal tuberculosis treated by physiologic exclusion of the affected part, operated upon in Czerny's clinic during a period of four years. ("Ueber Darmoperationen an der Heidelberger Chirurgischen Klinik, etc." Dissertation, 1896.) In all cases the disease was located in the cecum and had given rise to chronic obstruction. In two cases the anastomotic opening was made between the ileum and transverse colon, and one between the ileum and the ascending colon. In two cases the cecum was incised and the tubercular ulcers curetted. The visceral incision was closed by suturing parallel with the long axis of the bowel. In one case the diseased appendix was excised in addition. In one the gall bladder was extirpated at the same time for lithiasis and chronic inflammation. In all of the cases the contraindications to resection were well defined. In one case the operation was done by the use of the Murphy button, which was removed from the ampulla of the rectum on the fifteenth day after a severe hemorrhage three days previously. The pulmonary symptoms became seriously aggravated after the hemorrhage. All these cases recovered and the patients left the hospital improved. In one case (reported *in extenso* above), a fecal fistula developed, which was sutured on two occasions with partial success.

The exclusion of the affected part of the intestine although not complete, led to speedy healing of the ulceration, as was shown in one case at the second operation, four and one-half months later. The healing of the ulcers was undoubtedly favored by the atrophy and diminished peristaltic action, conditions which are always established in the excluded part soon after the operation.

James Israel ("Ueber Chirurgische Heilung von Peritoneal und Darmtuberkulose," *Centralblatt für Chirurgie*, 1896, No. 4) reported to the Surgical Society of Berlin a case of tuberculosis of the cecum and ascending colon in a woman 20 years of age, greatly improved by establishing a communication between the ileum and the ascending colon. The disease was attended by symptoms indicative of chronic intestinal tuberculosis. Exploratory laparotomy was performed and a probable diagnosis of sarcoma was made. The mesenteric glands were found enlarged. Later a second operation was performed, when a swelling the size of an apple was found projecting into the ascending colon, complicated by disseminated peritoneal tuberculosis. The patient made a good recovery, gained in weight, and after seven months, the swelling was reduced in size to that of a walnut.

Gessner ("Entero-anastomose bei tuberculöser Darmstriktur," *Centralblatt f. Chirurgie*, 1896, No. 6) made a laparotomy on a case in which the cecum was tubercular and had attained the size of a goose-egg. The swelling was nodulated and the serous coat studded with miliary tubercles. The obstruction caused by cicatricial stricture in the region of the ileo-cecal valve was relieved by an anastomosis between the ileum and the ascending colon, which was made by the aid of the Murphy button. The button was discharged per rectum on the thirteenth day.

The operation was followed by manifest improvement.

A very interesting case of intestinal tuberculosis complicated by invagination came under the observation of Czerny and is reported in detail by Murwedel ("Ueber Entero-anastomose, etc." *Beiträge zur Klinischen Chirurgie*, B. xiii, Heft 3). The patient was a boy 14 years of age who, two months prior to his admission into Czerny's clinic, was suddenly taken ill with vomiting and severe pain in the abdomen, attended with the appearance of a swelling in the upper and right side of the abdomen. In a few days the pain subsided and the vomiting occurred less frequently. A sausage-shaped tender swelling, above the umbilicus, remained. Bowels could only be moved by the use of injections. For a few days during the early part of the attack the stools contained traces of blood. On his admission into the clinic, June 2, 1894, the patient presented an anemic appearance and was considerably emaciated. There was no fever, lungs and heart normal. Inspection and palpation revealed the existence of a cylindric swelling, ten centimeters in length, in the region of the transverse colon. The swelling was slightly movable and tender on deep pressure. Liver, spleen and kidneys were normal in size and function. Under rectal insufflation the swelling increased in size, and dulness on percussion gave way to tympanitic resonance. Capacity of colon was only three pints. The rectal injection did not increase the dulness on percussion over the swelling and was followed by the escape of hard fecal masses. Chronic invagination of ascending and transverse colon was diagnosed. Operation was performed June 6. Median incision was made from xiphoid cartilage to umbilicus, which later had to be extended two inches to bring the invaginated colon forward into the wound. The swelling, the size of two fists, was composed of the cecum and ascending colon, into which the lower portion of the ileum had become invaginated. The intussusception could be traced as far as the right flexure of the colon. Reduction, owing to the presence of extensive adhesions, was found impossible, and resection was contraindicated by the debilitated condition of the patient. An entero-anastomosis between the ileum above the invagination and the middle third of the transverse colon, was established by incising the previously approximated ileum and colon and suturing the visceral wounds with two rows of sutures in the usual manner. Abdominal incision was closed throughout.

The existence of a tubercular lesion of the invaginated bowel was suspected from the presence of a plastic caseous perityphlitis. Recovery was without any untoward symptoms. Patient left the hospital August 9, swelling much diminished in size, bowel movements normal. A year later the patient remained in good health and examination showed that the invagination swelling had nearly disappeared. The tubercular complication presented itself in the form of caseous adhesions found at the time the operation was performed. The infection probably occurred from the intestinal canal. Whether the tuberculosis occurred as a primary affection or whether it appeared after the invagination had taken place, would be difficult to determine. Flenier describes two other cases of intestinal tuberculosis from Czerny's clinic in which the pathologic conditions produced by the disease gave rise to invagination (*Virchow's Archiv*, B. 101).

The cases reported above furnish conclusive proof

of the therapeutic value of entero-anastomosis in the treatment of intestinal tuberculosis, sufficiently limited to warrant surgical interference and beyond the reach of successful treatment by more radical measures.

Complete physiologic exclusion.—Practical experience has demonstrated the value of partial physiologic exclusion in the treatment of certain forms of localized intestinal tuberculosis. It would be natural to assume that the therapeutic value of entero-anastomosis would be enhanced if the affected part of the bowel could be completely excluded from the fecal circulation, thus securing for the diseased tissue a condition of absolute rest. At the time the writer made his experiments on physiologic exclusion of parts of the intestinal canal, he had this object in view and made a number of experiments to demonstrate the possibility and practicability of the procedure. The exclusion was made by isolating a section of the intestine and closing its ends by invagination and a few Lembert sutures. The continuity of the intestinal canal was restored by circular suturing or lateral anastomosis. The results of these experiments proved unsatisfactory, as it was found that the retained intestinal secretions constituted a source of danger. A few years later, Salzer modified the operation by establishing a fistula in connection with the excluded portion. This method of effecting complete physiologic exclusion has been resorted to only in a very few cases in the surgical treatment of intestinal tuberculosis. I will limit myself to a detailed reference to v. Eiselberg's case.

In a case of tuberculosis of the cecum, ascending colon and hepatic flexure, this surgeon ("Zur Casuistik der Resectionen und Entero-anastomosen am Magen und Darmcanal," *Arch. f. Klin. Chirurgie*, B. 54, Heft 3), resorted to complete physiologic exclusion, with temporary benefit. The patient was a man 35 years old, who was in good health until five years ago, when a tubercular affection of the foot developed, followed soon by symptoms of acute pulmonary tuberculosis. Three years ago, the head of the tibia was operated upon by curettage, for tubercular caries. During the healing of the wound the patient suffered from an attack of perityphlitis, from which he recovered, but the disease was followed by periodic pains in the ileo-cecal region, at short intervals. During the last few months the pulmonary symptoms became aggravated and an obstinate diarrhea set in. On admission into the hospital, examination revealed

extensive tubercular infiltration of left apex of lung and a cylindric swelling in the region of the cecum; the swelling was somewhat movable and tender on pressure. Operation was commenced, by making an oblique incision directly over the cecum. The cecum was found smaller than normal and not adherent. The infiltration extended from the ileo-cecal valve to the middle of the transverse colon. The affected portion of the bowel was completely excluded and the continuity of the intestinal canal restored by circular suturing, the resected end of the ileum had to be joined with the transverse colon. The mucous membrane, at the points of section, appeared to be healthy. The ends of the excluded portion were fixed in the upper and lower angles of the wound, respectively, and the balance of the abdominal incision was closed in the usual manner. From the excluded portion of the intestine mucus and pus escaped in considerable quantities. The patient improved temporarily. On the seventh day the affected part of the bowel was washed out carefully, from both ends, with a warm physiologic solution of salt. These irrigations proved the competency of the ileo-cecal valve. The flushings were found useful in diminishing the amount of the inflammatory product. The patient left his bed in three weeks. A few days later the pulmonary symptoms became more marked and when the patient left the hospital, a week later, he was attacked with pulmonary hemorrhage, which recurred several times and from the effects of which he died two months after the operation. Diarrhea reappeared soon after the operation and continued to the end. The persistence with which the diarrhea continued soon after the operation tends to establish the existence of the tubercular lesion of the mucous membrane beyond the limits of the operation.

Complete physiologic exclusion will, in all probability, have a very limited scope in the surgical treatment of intestinal tuberculosis, as the immediate dangers to life are almost equivalent to the risks incident to resection and the advantages over those of partial exclusion are not sufficient to warrant a more general recourse to this procedure. There can be but very little doubt that with an increased knowledge of the etiology and pathology of intestinal tuberculosis surgeons will be induced to resort to operative treatment more frequently in the future, and that with further improvements in the technic of intestinal operations, the surgical treatment will yield more encouraging results.

